Delivering earthquake warnings to the U.S. west coast

Earthquake early warning summit
April 4-5, 2011, UC Berkeley
Meeting goals

To raise awareness of the capabilities of realtime geophysical networks

To review the recent events in Japan and the performance of their warning systems

To share information about the current status of earthquake early warning in the U.S.

To develop a path forward for development and possible implementation in the U.S.

Day 1: For the geophysics community to share information and plan a comprehensive path
Outcomes: prepare a summary/resolution? EOS article?

Day 2: Engage industry and government in our planning, obtain their suggestions and guidance, and ask for their help
Outcomes: obtain feedback and support
Thank you

To everyone for participating on such short notice

To the planning committee: Tom Heaton, John Vidale, Richard Allen

To the UC Berkeley folks who put the meeting together: Mark Richards, Deborah Miller, Chris Treadway, Bob Sanders, Peggy Hellweg, Judith Coyote
10:00 a.m.  Welcome, introductions, purpose of meeting

10:30 a.m.  **Summary of the 2011 Tohoku-oki earthquake** (30 mins each)
Seismological overview of the earthquake – Hiroo Kanamori (Caltech)
Earthquake warnings in Japan – Richard Allen (UC Berkeley)
Discussion: Lessons learned

Noon    Lunch

1:00 p.m.  **Early warning testing in the US** (15 mins each)
USGS perspective of early warning – Mike Blanpied (USGS)
ShakeAlert overview/ElarmS/GPS – Richard Allen (UC Berkeley)
DecisionModule/UserDisplay/Onsite – Maren Bose (Caltech)
Reaching out to users – Peggy Hellweg (UC Berkeley)
The role of the SCEC community – Greg Beroza (Stanford)
Pacific Northwest perspective – John Vidale (U. Washington)

2:45 p.m.  Break

3:00 p.m.  **Emerging technologies for early warning** (15 mins each)
RealTime GPS/Seismic and EEW results from El Mayor Cucapah and Honshu
earthquakes – Yehuda Bock (UCSD/Scripps)
Application of Real-Time GPS to Cascadia Earthquake Early Warning – Tim
Melbourne (Central Washington U.)
Caltech Community Network – Tom Heaton (Caltech)
QuakeCatcher Network – Jesse Lawrence (Stanford)
iShake – Alex Bayen (UC Berkeley)

4:30 p.m.  Wrap up/Preparation for Day 2

5:00 p.m.  Adjourn

6:00 p.m.  Dinner
Dinner: 6pm
Adagia
2700 Bancroft Way
Berkeley, CA 94704
Day 2: Engage industry and government in our planning, obtain their suggestions and guidance, and ask for their help.

Outcomes: obtain feedback and support

Agenda – Day 2

8:30 a.m. Continental breakfast
9:00 a.m. Welcome, introduction, purpose of meeting
9:30 a.m. The March 11, M9 Tohoku earthquake: What happened
           Hiroo Kanamori (Caltech)
10:15 a.m. Current status of early warning in the US
           Tom Heaton (Caltech)
11:00 a.m. How industry, government, and the public could use warning in the
           US, and what is needed to deliver it
           Richard Allen (UC Berkeley)
11:30 a.m. Open discussion
Noon Working Lunch
1:30 p.m. Adjourn
Path to delivery of early warning in the U.S.

1. Long-term goal:
   Open public system in California, Oregon and Washington similar to Japan

Requires
- Additional stations (white)
- Upgrades to existing stations
- Continuous realtime GPS
- Robust telemetry
- Methodology development
- 24/7 operations
- Warning delivery systems
- Public education campaign

Cost of 5-year implementation plan
- $80M California
- $65M Washington and Oregon
Path to delivery of early warning in the U.S.

2. Immediate steps

**Identification of warning applications in the U.S.**
- industry-by-industry assessment of uses for early warning
- cost benefit analyses in the context of shaking risk

**Work with potential users to start delivery of test alerts**
- identify necessary information and delivery mechanisms
- complete demonstration projects and begin delivery testing

**Make existing test software in CA robust**
- move the current “research” system to a “production” system
- develop additional warning applications (software)

**Develop additional and improved hazard estimation methodologies**
- application of realtime GPS methodologies
- use of “community networks” e.g. sensors embedded in consumer electronics
- realtime mapping of finite fault ruptures

**Others?**